Dosimetric Comparison Between IMAT and IMRT for Different Planning Target Volume of Esophageal Cancer.

Objective: To compare the dosimetric differences between Intensity modulated arc therapy (IMAT) and static intensity modulated radiotherapy (IMRT) for different PTV volume of esophageal cancer(ＥＣ).

Methods Fourty patients who were diagnosed with thoracic esophageal cancer. Including 10 cases located in the upper, middle and the lower thorax, respectively. IMAT and IMRT two plans were generated with the The Elekta Oncentra4.1 Planning System in Varian 23EX Linac, prescription dose of 60Gy in 30 fractions to the PTV(see figure1). All treatment plans of the 40 cases were evaluated using the dose-volume histogram parameters of PTV and the organs at risk. The monitor units (MUs) were also examined.

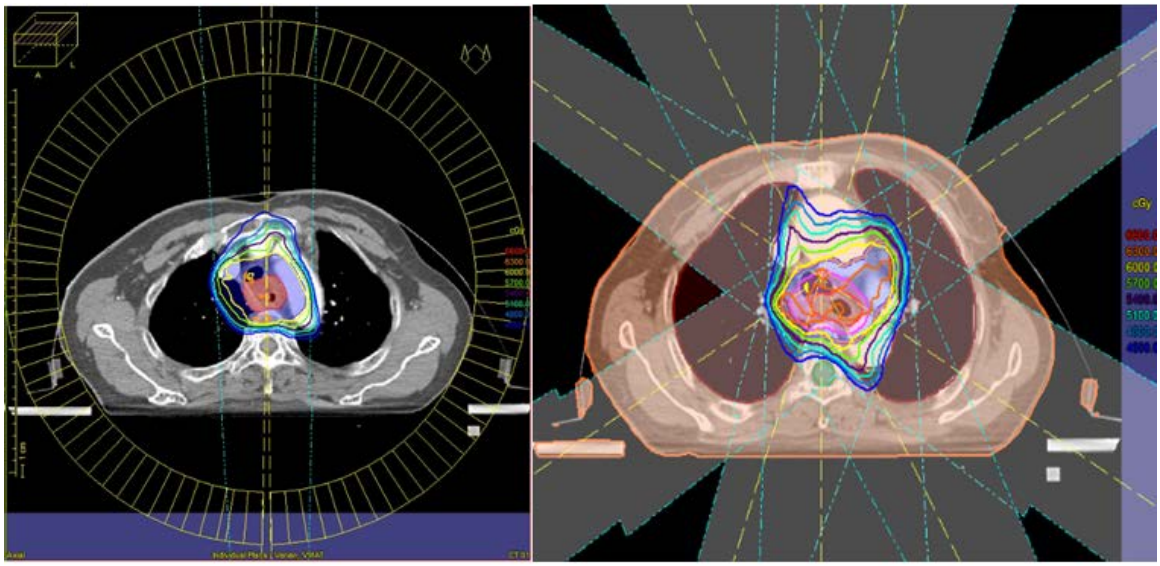

Figure 1. The dose distribution of two radiotherapy ways (the left is IMAT, the right is IMRT) .

TABLE I. THE DOSIMETRIC PARAMETERS COMPARISON OF IMAT AND IMRT IN DIFFERENT TARGET VOLUME (X ± S)

content	IMAT	IMRT	T value	*P* value
PTV D2 (cGy)				
<50	6499.01±131.78	6575.50±139.08	-2.485	0.025
50-150	6522.97±223.20	6519.68±196.3	0.126	0.902
>150	5823.9±134.9	6714.43±196.25	0.468	0.646
PTV D98 (cGy)				
<50	5910.7±53.0	5810.3±89.2	3.628	0.002
50-150	5839.7±165.1	5790.1±146.9	2.897	0.01
>150	5823.9±134.9	5808.4±141.7	1.134	0.275
PTV HI				
<50	1.07±0.02	1.09±0.02	-3.41	0.004
50-150	1.08±0.03	1.09±0.02	-0.41	0.690
>150	0.11±0.05	1.11±0.04	0.52	0.615
PTV CI				
<50	0.646±.039	.73±.036	-5.963	0.004
50-150	.68±.08	.72±.078	-5.966	0.002
>150	.71±.08	.73±.072	-1.879	0.119

Results For PTV volume <50cm3 group (PTVs), IMAT plan had superior homogeneity when compared with IMRT plan(see table1), while the lung V5 and MLD were slightly higher for IMAT plan. For50 ~150cm3 group(PTVm), PTV D95 for VMAT got closer to prescription dose,IMAT plan resulted in a slightly lower lung V10 and higher lung V30. However, IMAT plan had lower V100 in the PTV, compared to IMRT plan for PTV volume >150cm3 group (PTVb), and sparing of lungs showed no statistically significant differences between the two techniques. When compared with IMRT plan, IMAT plan reduced the monitor units by an average of 15% and 25% in the PTVm group and PTVb group. However, IMAT plan provided an average of 13.5% more monitor units than IMRT plan in the PTVs group.

Conclusion For small panning target volume IMAT is better than IMRT, not only in treatment time but also in the PTV dose, is the first choice. In addition, IMAT plan provides equivalent conformal dose coverage and sparing of OARs for the medium panning target volume EC with less delivery time. However, IMRT is the first choice for a large planning target volume EC, since IMAT plan with worse target volume coverage and even increases the spring of OARs.